It will be noticed that the true position of rest is slightly rising in value, and this rise was found to continue at the rate of 0·36 centimetre an hour during the whole course of the experiment, and to be the same when the large masses were in the positive or negative position. The motion was perfectly uniform, and in no way interfered with the accuracy of the experiments. It was due, I believe, to the shellac fastening of the fibre, for I find that immediately after a fibre has been attached, this movement is very noticeable, but after a few days it almost entirely ceases; it is, moreover, chiefly evident when the fibre is loaded very heavily. At the time that the experiment was made the instrument had only been set up a few hours.

The mean decrement of three positive sets was 0·8011, and of three negative sets, 0·8035. The observed mean period of three positive sets was 79·98, and of three negative sets, 80·03 seconds, from both of which 0·20 must be deducted as the time correction for damping.

The deflections, in centimetres, obtained from the six sets of observations taken in groups of three, so as to take into account the effect of the slow change of the position of rest, were as follows:—

From sets 1, 2, and 3 ...	17·66 ± 0·01
,, 2, 3, and 4 ...	17·65 ± 0·02
,, 3, 4, and 5 ...	17·65 ± 0·02
,, 4, 5, and 6 ...	17·65 ± 0·02

An examination of these figures shows that the deflection is known with an accuracy of about one part in two thousand, while the period is known to the 4000th part of the whole. As a matter of fact, the discrepancies are not more than may be due to an uncertainty in some of the observations of ½ millimetre or less, a quantity which, under the circumstances, is hardly to be avoided.

The result of these experiments is complete and satisfactory. As a lecture experiment, the attraction between small masses can be easily and certainly shown, even though the resolved force causing motion is, as in the present instance, no more than the 1/200,000 of a dyne (less than 1/10,000,000 of the weight of a grain), and this is possible with the comparatively short half period of 80 seconds. Had it been necessary to make use of such half periods as three to fifteen minutes, which have been employed hitherto, then, even though a considerable deflection were produced, this could hardly be considered a lecture experiment. So perfectly does the instrument behave, that there can be no difficulty in making a fairly accurate measure of the attraction between a pair of No. 5, or, I believe, even of dust shot.

The very remarkable agreement between successive deflections and periods shows that an absolute measure made with apparatus designed for the purpose, but on the lines laid down above, is likely to lead to results of far greater accuracy than any that have been obtained. For instance, in the original experiment of Cavendish there seems to have been an irregularity in the position of rest of one-tenth of the deflection obtained, while the period showed discrepancies of five to fifteen seconds in seven minutes. The experiments of Baily, made in the most elaborate manner, were more consistent, but Cornu was the first to obtain from the Cavendish apparatus results having a precision in any way comparable to that of other physical measurements. The three papers, published by him in the *Comptes rendus* of 1878, referred to above, contain a very complete solution of some of the problems to which the investigation has given rise. The agreement between the successive values, decrement, and period is much the same as I have obtained, nevertheless the means of the summer and of the winter observations differ by about 1 per cent.

I have not referred to the various methods of determining the constant of gravitation in which a balance, whether with the usual horizontal beam, or with a vertical beam on the metronome principle, is employed. They are essentially the same as the Cavendish method, except that there is introduced the friction of the knife-edges and the unknown disturbances due to particles of dust at these points, and to buoyancy, without, in my opinion, any compensating advantage. However, it would appear that if the experiment is to be made with a balance, the considerations which I have advanced in this paper would point to the advantage of making the apparatus small, so that attracting masses of greater proportionate size may be employed, and the disturbance due to convection reduced.

It is my intention, if I can obtain a proper place in which to make the observations, to prepare an apparatus specially suitable for absolute determinations. The scale will have to be increased, so that the dimensions may be determined to a ten-thousandth part at least. Both pairs of masses should, I think, be suspended by fibres or by wires, so that the distance of their centres from the axis may be accurately measured, and so that, in the case of the little masses, the moment of inertia of the beam, mirror, &c., may be found by alternately measuring the period with and without the masses attached. The unbalanced attractions between the beam, &c., and the large masses, and between the little masses and anything unsymmetrical about the support of the large masses, will probably be more accurately determined experimentally by observing the deflections when the large and the small masses are in turn removed, than by calculation.

If anything is to be gained by swinging the small masses in a good Sprengel vacuum, the difficulty will not be so great with apparatus made on the scale I have in view, *i.e.* with a beam about 5 centimetres long, as it would with large apparatus. With a view to reduce the considerable decrement, I did try to maintain such a vacuum in the first instrument, in which a beam 1·2 centimetre long was suspended by a fibre so fine as to give a complete period of five minutes, but though the pump would click violently for a day perhaps, leakage always took place before long, and so no satisfactory results were obtained.

With an apparatus such as I have described, but arranged to have a complete period of six minutes, it will be possible to read the scale with an accuracy of 1/10,000 of the deflection, and to determine the time of vibration with an accuracy about twice as great.

I hope early next year, in spite of the difficulty of finding a suitable place to observe in, to prepare apparatus for absolute determinations, and I shall be glad to receive any suggestions which those interested may be good enough to offer.

C. V. BOYS.

WILLIAM RAMSAY McNAB.

WILLIAM RAMSAY McNAB, M.D., whose sudden death from heart-disease we have already recorded, was born in Edinburgh in November 1844. He was educated at the Edinburgh Academy, and afterwards in the University of that city, obtaining the degree of Doctor of Medicine when twenty-two years of age.

His grandfather and father, in succession, held office as Curators of the Edinburgh Botanic Garden; and the late Dr. McNab early manifested an inherited capacity for botanical work; for, while still an undergraduate, he was appointed assistant to Prof. Balfour, who then held the Edinburgh botanical chair. He also entered the University of Berlin as a student—in botany under Profs. Braun and Koch, and in pathological anatomy and histology under Prof. Virchow. Three years of his later life were spent in medical practice; but his love of botany was his dominant feeling, and in 1870 he embarked upon a purely biological career, having been then appointed to the Professorship of Natural History

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in the Royal Agricultural College, Cirencester. Two years later he succeeded to the Chair of Botany in the Royal College of Science, Dublin, and this post he held until his death. During his student life he paid considerable attention to the practical study of geology; and for many years he collected Coleoptera, of which he possessed a very fine collection, now in the Dublin Museum of Science and Art.

During the nineteen years exclusively devoted to natural science, Prof. McNab published a considerable number of technical papers; most of these were short, but some forty or fifty of them are fit to rank as original communications. The work by which he is best known was that upon the movements of water in plants. Following a suggestion of Prof. A. H. Church, that lithium might prove useful in his researches, he instituted experiments which proved the value of this method, and paved the way for later investigators. McNab's chief claim to distinction lay, however, not in the direction of pure research, but in the fact of his having been the first to introduce to British students the methods of Sachs, now universally adopted. He inaugurated the modern methods of teaching botany at Cirencester, in the year 1871, and at Dublin two years later; and he fully admitted his indebtedness to the first edition of Sachs's celebrated "Lehrbuch der Botanik." Dr. McNab was, at the time of his death, an examiner in botany to the Victoria University, Manchester. The appointment of Scientific Superintendent of the Royal Botanic Gardens, Glasnevin, Dublin, was created for him in 1880, and in connection with this office he issued, five years later, an enlarged and considerably revised Guide-book. He was joint author, with Prof. Alex. Macalister, of a "Guide-book to the County of Dublin," prepared on the occasion of the visit of the British Association to that city. In 1878 he published, in Longmans' "London Science Series," two botanical class-books, entitled "Outlines of Morphology and Physiology," and "Outlines of Classification"; and he leaves behind him the first few chapters, and a large amount of manuscript in a nearly completed condition, of a contemplated "Text-book of Botany," which he was to have written for Messrs. C. Griffin and Co. In 1888 he was appointed Swiney Lecturer to the British Museum of Natural History, and in that capacity he has lectured for two sessions. His discourses, which were upon "The Fossil Plants of the Palæozoic Epoch" and "Ferns and Gymnosperms of the Palæozoic and Mesozoic Epochs, and dawn of the Angiospermous Flora" respectively, were attended with much success. He has left behind him carefully written manuscript lectures, which it is sincerely hoped may be published as a memorial volume. At the time of his decease he was actively engaged upon his intended third course, in which he would have dealt with the Cainozoic flora. He was an excellent teacher, possessed of a natural aptitude for the work; and his laboratory instruction was characterized by thoroughness and precision. As a lecturer he was fluent and entertaining; and, in his several capacities, he endeared himself to those with whom he came in contact. Friends, colleagues, and students, alike mourn his loss.

NOTES.

THE death of Prof. Lorenzo Respighi, Director of the Osservatorio Campidoglio, Rome, which we deeply regret to announce, is a great loss to science. He died on December 10.

IN a recent number we gave some account of a meeting held in Manchester on November 25 for the purpose of preparing the way for the erection of a memorial of James Prescott Joule in that city. It was resolved that the memorial should be in the form of a white marble statue, and a committee was appointed to carry out this resolution. At the first meeting of the committee, on November 29, an executive committee was appointed, and the following motion was adopted:—"That the movement be directed to secure, not only a marble statue of the late Dr. James Prescott Joule as a companion to that of the late Dr. Dalton by Sir Francis Chantrey, but also a replica in bronze to occupy some public place in the city, and that the executive committee be instructed to take all needful steps for that purpose." Many subscriptions have been already promised.

AN attempt is being made to secure the erection of an international monument to James Watt at Greenock, his birthplace. It is proposed that the memorial shall be "a large and thoroughly equipped technical school."

A NEW fortnightly scientific periodical is about to be published in Paris. It will be entitled *Revue Générale des Sciences Pures et Appliquées*, and will deal with the mathematical, physical, and natural sciences, and with their appli-ca-tions in geodesy, navigation, engineering, manufactures, agriculture, hygiene, medicine, and surgery. According to the preliminary statement, the new periodical will take as its model the method of exposition adopted in NATURE. The editor is M. Louis Olivier, and the list of contributors includes many of the most eminent French men of science. The first number will appear on January 15, 1890.

THE second Report of the Committee appointed by the British Association to inquire into, and report upon, the present methods of teaching chemistry, which was presented at the Newcastle meeting, and to which we called attention in these columns a short time ago, has now been put on sale by the Council. It may be obtained from the office of the Association, 22 Albemarle Street, W.

ON Tuesday evening, after the distribution of the prizes and certificates to the students of the City and Guilds of London Institute, at Goldsmiths' Hall, Sir Henry Roscoe congratulated the students of the various schools upon the reports he had heard. He observed that the City Guilds were now engaged separately and collectively in nobly carrying out the work for which they were, to a certain extent, originally founded. The Technical Instruction Bill which was passed in the last session of Parliament had materially changed the whole aspect of affairs, and sooner or later a complete scheme for technical education would have to be framed. The beginning of such a scheme had been made by the efforts of the City of London Institution, which, with its many branches, was a nucleus of such a system, the importance of which would only be recognized when the history of that important movement came to be written. It was a satisfactory thing to hear that employers of skilled labour were beginning to find out that the men who had been trained at such Colleges as these were of greater value than those who had not received such training. It was not only necessary to educate the craftsman; the employer needed it equally, if not more. He thought that the Council of the Institute had fully recognized that fact at their Central Institution, but a demand for high-class education had yet to be created.

THE *British Medical Journal* says that owing to the somewhat late period in the year at which the invitation to hold the annual meeting of the British Medical Association in Birmingham was received and accepted, the arrangements are not yet so complete as in former years; but a large general committee and all the necessary sub-committees have been formed, and the use of the requisite public buildings has been obtained.

ON March 1, 1890, a new marine laboratory will be opened at Saint-Wast-la-Hougue.

WE are glad to know that there will soon be well-equipped physical and chemical laboratories at Bedford College, London. Mr. Tate, who has already given £1000 towards the new College buildings, which are on the eve of completion, has

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